Evaluation of Angiographic Parameters in Patients with Chronic Heart Failure

1. **Rukhshona Khomidovna Musaeva, Ph.D**

[1] Department of Propaedeutics of Internal Diseases Bukhara State Medical Institute , Uzbekistan, rukhshonam@bk.ru

Abstract: The article presents data on the study of the features of angiographic changes in patients with chronic heart failure (CHF). The aim of the study is to determine the relationship of clinical and angiographic data with the clinical course of the disease. The study involved 112 patients with FC II-III CHF aged 52.52 ± 6.21 years, who were inpatient treatment at the regional multicenter medical center of the Bukhara region. In patients with CHF, coronary artery lesions had a relationship with the severity of the disease; in patients with CHF II-III FC, the degree of coronary artery stenosis had a direct correlation with the), a clinical condition assessment scale indicator, and an inverse correlation with the six-minute walk test and LVEF.

Keywords: Chronic heart failure, Coronary angiography, Revascularization.

Introduction

Chronic heart failure (CHF) is one of the most common complications and outcomes of heart disease. According to the latest recommendations (2016), "1-2% of the adult population of developed countries have heart failure." CHF occurs in the active period of life that is, in patients aged 40-60 years and is characterized by a frequent cause of CHF, associated with an increased risk of death, a decrease in the quality of life and high costs of treatment [1,2].

Early diagnosis of CHF using high-tech methods, predicting the course of the disease, developing therapeutic measures and, as a result, reducing morbidity, disability and mortality rates, improving the quality of life of patients' prognosis is of priority importance [3,4].

Currently, a number of priority studies are being carried out in the world to improve the diagnosis and treatment of CHF, including determining the prognostic value of endovascular methods in diagnosing the disease, developing approaches to treatment using various types of stents, predicting the course of the disease and complications after interventional interventions, improving the clinical the course and quality of life of patients, by increasing the efficiency of immediate and long-term results, reducing complications by determining the factors involved in the pathogenetic mechanisms of thrombosis and restenosis, improving prognosis [5,6].

Purpose of Work

The aim of the study is to determine the relationship of clinical and angiographic data with the clinical course of the disease, to optimize the prognosis in patients with CHF.

Material and Research Methods

The study involved 112 patients with FC III CHF at the age of 52.52 ± 6.21 years who were inpatient treatment at the regional multicenter medical center of Bukhara region. All patients underwent a six-minute walk test (*6MWT*), the clinical condition assessment scale, clinical-physical and angiographic studies. Men accounted for 62 (55.4%) patients and women - 50 (54.6%) patients. Patients with FC II CHF made up 39 (34.8%) patients, and with FC III CHF 73 (65.2%).

The exclusion criteria from the study were: patients with previous PCI with stenting or coronary artery bypass grafting (CABG) in history; with severe concomitant pathology of the cardiovascular system (aortic aneurysm; valvular pathology requiring surgical correction; severe systolic dysfunction of the left ventricle (LV) (ejection fraction $_{LV}$ <35%); severe renal failure); patients intolerant to taking anticoagulants / antiplatelet agents; persons with bifurcation lesions. To assess the X-ray morphological characteristics of patients, selective coronary angiography (CAG) of coronary vessels was performed taking into account angiographic parameters: percentage of stenosis, number of stenotic lesions, classification of stenotic lesions by types A-B-C, localization of lesions (proximal, middle, distal) and artery diameter. The following basins of coronary arteries were studied: the anterior descending artery (LAD), the circumflex artery (CA), the *obtuse marginal branch* (OMB), the intermediate artery (IA), the right coronary artery (RCA), left coronary artery (LCA), the posterior interventricular artery or posterior descending artery (PDA) and the left ventricular branch (LVB).

In the study, SYNTAX-Score was calculated for all patients using an on-line calculator at the website http://www.syntaxscore.com. The data obtained by us during the study were subjected to statistical processing on a Pentium-IV personal computer using the Microsoft Office Excel - 2013 software package, including the use of built-in statistical processing functions, as well as using the STATISTICA-6.0 software package. We used the methods of variational parametric and nonparametric statistics with the calculation of the arithmetic mean of the studied indicator (M), standard deviation (SD), standard error of the mean (m), relative values (frequency,%), the statistical significance of the obtained measurements when comparing the mean values was determined by the criterion Student's t (t) with the calculation of the error probability (P) when checking the normal distribution (by the kurtosis criterion) and the equality of the general variances (F is the Fisher test). The level of reliability p <0.05 was taken as statistically significant changes. When comparing groups by qualitative characteristics, we used the $\chi2$ criteria. To study the relationship between quantitative variables, correlation analysis was used with the calculation of the Pearson's linear correlation coefficient.

Research Results

Analysis of the results of the study showed that patients with FC II were 39 (34%) and FC III 73 (65%). A history of arterial hypertension was observed in 97 (86%) patients, after MI in 17 (15%) patients. Assessment of the contractility of the left ventricular myocardium in this group of patients showed that an ejection fraction of more than 50% was found in 55 (49.1%) patients, 50-40% in 37 (33%) and less than 40% in 20 (17.9%) patients (table 1).

In the examined patients with CHF, right-sided type of blood supply was observed in 55 (49%) patients, left-sided in 27 (24%) patients. In patients with FC III CHF, the right coronary type of blood supply prevailed in 52% (p = 0.050; $\chi2$ = 2.37) of patients (Table 2). The study also used the SYNTAX-Score data processing method, which is an indicator that determines the severity of

coronary lesions. In patients with CHF, this parameter was 9.68 ± 4.39 points, in patients with FC II CHF, this indicator was 9.18 ± 4.63 points, and in patients with FC III CHF, 9.81 ± 4314 points.

Table 1. Clinical characteristics of patients with CHF

	Number of patients	FC II n(%)	FC III n(%)
Common	112(100%)	39 (34.8%)	73(65.2%)
Men	62(55,4%)	17(15,2%)	45(40,2%)
Women	50(54,6%)	22(19,6%)	28(25%)
Hypertension	97(86,6%)	35(31%)	62(55.4%)
Diabetes mellitus (DM)	13(11,6%)	1(0,89%)	12(10,7%)
Smoking	32(28,6%0	1(0,89%)	10(8,9%)
Obesity	81(72,3%)	28(25%)	53(47%)
Myocardial infarction	17 (15,2%)	6(5%)	11(9,8%)
Angina pectoris	90 (80,4%)	30(26,8%)	60(53,6%)
SYNTAX average score	9,68±4,39	9,18±4,63	9,81±4314

Table 2

	Right	Left	Balanced
General	55(49%)	27(24%)	31(27%)
FC II	19(16,96%)	9(8%)	11(9,8%)
FC III	38(33,9%)	15(13,4%)	20(17,9%)

Angiographic characteristics in the examined patients revealed (Table 3) that the degree of stenotic contractions was 55-60% in 9 patients, 60-70% in 6 patients, 70-85% in 11 and 85-95% in 34 patients. Total coronary artery disease was encountered in 7 (6.3%) patients, Left anterior descending artery (LAD) lesions in 69 (61.6%) and circumflex artery (CA) in 33 (29.5%) patients. The incidence of atherosclerotic lesions in the area of the right coronary artery (RCA) was 42.9% of patients. The degree of stenotic narrowing according to RCA was characterized by 55-60% in 9 patients, 60-70% in 5 patients, 70-85% in 7 and 85-95% in 23 and complete occlusion in 7 patients. Narrowing of the left coronary artery (LCA) to 50-60% was detected in seven patients, 60-70% in 5 patients, 70-85% in 11, and 85-95% in 4 patients. The results show that in patients with FC III CHF, coronary artery lesions were most common up to 85-95%, while in 10% of patients total occlusion of coronary arteries was observed.

Table 3. Angiographic characteristics of the degree of involvement (%) of coronary arteries in patients with CHF

	Right coronary artery and left coronary artery				Total occlusion of the right coronary artery and left coronary artery	LAD	CA	Without changes
	55-60%	60-70%	70-85%	85-95%				
General (n=112) 100%	9(8%)	6(5,4%)	11(9,8%)	34(30,4%)	7(6,3%),	69(61,6%)	33(29,5%)	1(0,89%)

In the study, 37 (33%) patients had 2-vascular lesions. The defeat of ≥3 CA was registered in 8.9% of patients. When analyzing the relationship between the degree of coronary vascular lesions and the clinical course of CHF, it was found that with 55-60% of coronary arteries, the *6MWT* was 236.9

± 24.5 meters, with 85-95% lesions - 197.7 ± 24.8 meters. When studying the indicators of the clinical condition assessment scale, it was also found that with lesions of the coronary artery of 85-95%, this indicator was 13.19 ± 0.68 points, which was 1.7 times higher than the indicator of the clinical condition assessment scale with lesions of the coronary arteries of 55-60%. When studying the parameters of *6MWT*, depending on the parameters of left ventricular ejection fraction, both in patients with FC II and III, a direct correlation was revealed (r = 0.51, r = 0.63). An inverse correlation was found between the degree of stenosis of the coronary arteries and the indicators of *6MWT* and LVEF (r =-0.62, r = -0.55, respectively) and a direct correlation with the indicator of the clinical condition assessment scale (r = 0.71). In CHF, the clinical course of the disease and LV systolic dysfunction are associated with the degree of occlusion of the coronary arteries. Correlation of the degree of coronary artery disease with the clinical course of the disease and indicators of cardiac remodeling was revealed: a high inverse correlation with *6MWT* and EF (r = -0.71, r =-0.65, respectively) and a direct correlation with the clinical condition assessment scale and EDV of LV (r = 0, 64, r = 061, respectively) and an indicator of the quality of life (r =-0.51).

Discussion

Myocardial revascularization in patients with CHF of "ischemic" etiology is a promising method; however, successful intervention requires confirmation of myocardial viability, identification of myocardial contractile reserves before surgery. Predicted surgical mortality, anatomical features of coronary artery disease, and the ability to perform complete revascularization are important criteria in the choice of therapeutic tactics (PCI or CABG) [7,8]. Decision-making on the preferred treatment method (conservative treatment, PCI or CABG) is carried out when assessing the risk-benefit ratio of the intervention, clarifying the risks of developing periprocedural complications (for example, cerebrovascular events, the need for blood transfusion, the development of renal failure, rhythm disturbances or wound infection), as well as changes in the quality of life, long-term prognosis in relation to mortality, the likelihood of developing myocardial infarction or the need for repeated revascularization [9,10].

In patients with CHF II-III FC, lesions of the coronary arteries were identified, of which 85-100% lesions accounted for 30.4% of cases, while total occlusion occurred in 6.3% of cases. Analysis of coronary artery lesions showed that the prevalence of the degree of lesions was associated with a worsening of the clinical course of the disease on the clinical condition assessment scale with an increase in the FC of CHF and a deterioration in the quality of life of patients, which is consistent with the data of other scientists [11,12]. Severe lesions of the coronary arteries - 85-95% and total occlusion were significantly more frequent in the group of patients with reduced LV systolic function (EF <40%) and a relationship was revealed between the progression of the disease, as well as an increase in volume parameters - end-diastolic and end-systolic volumes LV with the degree of occlusion [13,14].

Conclusions

Thus, in patients with CHF, coronary artery lesions had a relationship with the severity of the disease, in patients with CHF II-III FC, the degree of coronary artery stenosis had a direct correlation with the clinical condition assessment scale indicator, and an inverse correlation with the *6MWT* and LVEF.

REFERENCES

1. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. 2016, European Heart Journal, 37 (27): 2129-2200.

2. Jeremias A, Kaul S, Rosengart TK, Gruberg L, Brown DL. 2009, The impact of revascularization on mortality in patients with nonacute coronary artery disease. Am J Med., 122: 152–161.

3. Bangalore S, Guo Y, Samadashvili Z, Blecker S, Hannan EL. 2016, Revascularization in patients with multivessel coronary artery disease and severe left ventricular systolic dysfunction: everolimus-eluting stents versus coronary artery bypass graft surgery. Circulation, 133(22): 2132-40.

4. Cardona M., Martín V., Prat-Gonzalez S., Ortiz J.T. et al. 2016, Benefits of chronic total coronary occlusion percutaneous intervention in patients with heart failure and reduced ejection fraction: insights from a cardiovascular magnetic resonance study. J Cardiovasc Magn Reson., Nov 5;18(1): 78.

5. Cleland JGF, Calvert M, Freemantle N. et al. 2011, The Heart Failure Revascularization Trial (HEART). Eur J Heart Fail., 13(2): 227-33.

6. Windecker S, Stortecky S, Stefanini GG. 2014, Revascularization versus medical treatment in patients with stable coronary artery disease: Network meta-analysis. BMJ., 348: g3859.

7. Yancy CW, Jessup M, Bozkurt B. et al. 2013, CCF/AHA Guideline for the management of heart failure: executive summary. A report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. Circulation, 128(16): 1810-52.

8. 2018 ESC/EACTS Guidelines on myocardial revascularization. 2019, European Heart Journal, 40: Is. 2, P.87–165.

9. Jeremias A, Kaul S, Rosengart TK, Gruberg L, Brown DL. 2009, The impact of revascularization on mortality in patients with nonacute coronary artery disease. Am J Med 122: 152–161.

10. Pyka L., Hawranek M., Gąsior M. 2017, Revascularization in ischemic heart failure with reduced left ventricular ejection fraction. The impact of complete revascularization. Kardiochir Torakochirurgia Pol. Mar; 14(1): 37–42.

11. Hwang S.J., Melenovsky V., Borlaug B.A. 2014, Implications of coronary artery disease in heart failure with preserved ejection fraction. J Am Coll Cardiol, 63: 2817–2827.

12. Hoebers L.P., Claessen B.E., Elias J., Dangas G.D. et al. 2015, Meta-analysis on the impact of percutaneous coronary intervention of chronic total occlusions on left ventricular function and clinical outcome. Int J Cardiol. 187: 90–6.

13. Khariton Y., Airhart S., Salisbury A.C., Spertus J.A. et al. 2018, Health Status Benefits of Successful Chronic Total Occlusion Revascularization Across the Spectrum of Left Ventricular Function: Insights From the OPEN-CTO Registry. JACC Cardiovasc Interv. Nov 26; 11(22): 2276–2283. doi: 10.1016/j.jcin.2018.07.058.

14. Megaly M, Saad M, Tajti P, Burke MN et al. 2018, Meta-analysis of the impact of successful chronic total occlusion percutaneous coronary intervention on left ventricular systolic function and reverse remodeling. J Interv Cardiol. Oct; 31(5): 562-571